

**WE CLAIM:**

1. A marking template for assisting drilling holes into a femur of a patient, comprising:

a top surface;

a bottom surface;

the bottom surface substantially formed to match a distal end of a femur;

and

an opening through the top and bottom surfaces adapted to guide a drill at a predetermined location along the distal end of the femur.

2. A system for installing a replacement device to a distal end of a femur having a trochlear groove surface, comprising: a marking template, wherein:

the marking template has a back side substantially matching the distal end of a femur; and

a hole through the marking template;

a drilling apparatus to form an opening on the distal end of the femur 5 assisted by the hole in the marking template; and

a replacement device, wherein:

the replacement device has a bottom side substantially matching the distal end of the femur; and

a pin protruding from the bottom side of the replacement device 10 adapted to insert into the opening on the distal end of the femur.

3. A system according to Claim 2, wherein the replacement device has a top side substantially tracking a trochlear groove of the femur.

4. A system according to Claim 2, further including a cement between the replacement device and the femur to bond the replacement device to the distal end of the femur.

5. A system according to Claim 2, further including a bone ingrowth surface between the replacement device and the femur to bond the replacement device to the distal end of the femur.

6. A method of making a replacement device, comprising the steps of:  
forming a model of a distal end of a patient's femur;  
forming a first mold from the model, wherein the first mold has a bottom side that substantially matches the trochlear groove of the patient's femur, wherein the first mold has a top side opposite of the bottom side;  
coupling a peg on a predetermined location on the bottom side of the first mold;  
shaping the top side of the mold to substantially track the trochlear groove of the patient's femur;  
forming a second mold from the first mold; and  
pouring viscous material into the second mold to make a replacement device.

7. A method according to Claim 6, further comprising the steps of:  
streamlining the edges of the replacement device.

8. A method according to Claim 6, further comprising the steps of:  
shaping the replacement device to have an oval shape defined by first, second, third, and fourth boundary conditions, wherein:  
the first boundary condition being approximately 3 mm to 5 mm from the attachment of an anterior cruciate ligament to the femur;  
the second boundary condition being approximately at least near the superior edge of an end of a natural cartilage of the femur;  
the third boundary condition being approximately at the top ridge of a right condyle of the femur; and  
the fourth boundary condition being approximately at the top ridge of a left condyle of the femur.

9. A method according to Claim 6, further comprising the steps of:

shaping the top surface of the replacement device to have a substantially similar thickness between the top and bottom surfaces, wherein the thickness is approximately between 2 mm and 6 mm.

10. A method according to Claim 6, further including the steps of:  
taking a predetermined number of sliced images along the distal end of a patient's femur;  
transposing each of the predetermined number of sliced images into a plate;  
cutting the sliced images from each of the plates;  
assembling each of the plates to define outer edges of the distal end of the femur; and  
applying filler over the outer edges to form the model of the distal end of the femur.

11. A method of forming a replacement device and a marking template device from a single mold, comprising the steps of:  
forming a model of patient's distal end of a femur;  
forming a first mold from the model, wherein the first mold has a back side that matches the trochlear groove of the femur, wherein the first mold has a face side  
opposite of the back side;  
shaping the face side of the first mold to substantially track the trochlear groove of the femur;  
forming a second mold from the first mold; and  
pouring a first viscous material into the second mold to make a replacement device.

12. A method according to Claim 11, further including the steps of:  
coupling a peg to the back side of the first mold at a predetermined location;  
removing the peg from the back side of the first mold;

forming a third mold from the first mold without the peg on the back side;  
and

pouring a second viscous material into the third mold to make a marking  
25 template.

13. A method according to Claim 11, further including the steps of:  
forming an opening through the first mold along the predetermined  
location.

14. A method according to Claim 11, wherein the first viscous material and  
second viscous material is the same material.

15. A method according to Claim 11, wherein the step for forming the model of  
patients distal end of the femur further includes the steps of:

compiling in a computer a CT image data of the patient's distal end of the  
femur;

creating a surface of the patients distal end of the femur; and

driving a computer assisted machine system to machine the model of 10  
patient's distal end of the femur.

16. A method of installing a replacement device to the trochlear groove of a  
patient's femur, comprising the steps of:

providing a replacement device having a bottom side that substantially 15  
matches the trochlear groove of a patient's femur, wherein the bottom side of the  
replacement device has a pin at a predetermined location;

providing a marking template having a back side that substantially  
matches the trochlear groove of the patient's femur, wherein the marking template has  
an opening corresponding to the predetermined location of the pin;

removing the cartilage from the distal end of the femur;

positioning the marking template about the femur substantially similar to  
the desired installed position of the replacement device;

drilling a hole on the distal end of the femur through the opening of the  
marking template;

removing the marking template from the femur; and  
inserting the pin of the replacement device into the hole of the femur to  
install the replacement device on the desired location of the femur.

17. A method according to Claim 16, wherein the replacement device has a plurality of pins, wherein the replacement device has a plurality of holes corresponding to the plurality of pins.

18. A method according to Claim 17, further including the steps of:  
bonding the replacement device to the femur by applying adhesive  
between the two.

19. A method according to Claim 17, further including the steps of bonding the replacement device to the femur by utilizing a bone ingrowth surface.